

FINA 7373/4373
Petrochemical and Refining Economics

Spring 2020

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The course applies economic concepts and analysis to understanding the structure and behavior of the global refining and petrochemical industries.

The instructors are Aditya Soman and Don Bellman.

Professor Soman is the head of Supply Operations at Motiva Enterprises (a subsidiary of Aramco). Prior to that Aditya held multiple roles in Engineering, Manufacturing and Strategy. He earned a bachelor's degree in mechanical engineering from the University of Poona, India a master's degree in Mechanical Engineering and an MBA from UT Austin.

Professor Bellman spent thirty-five years at Exxon working in a wide variety of functions, from plant operations, to acquisitions, to sales. He was Business Analysis and Strategic Planning Manager for Exxon Chemical's worldwide polymers businesses and subsequently Business Development Manager for the company's Global Polyethylene Business. He earned a bachelor's degree in mechanical engineering at Duke University, and a master's degree in business administration at Stanford University.

Course Materials

Textbooks: W. L. Leffler, "Petroleum Refining In Nontechnical Language", Fourth Edition, 2008 (Required)

D. L. Burdick and W. L. Leffler, "Petrochemicals In NonTechnical Language", Fourth Edition, 2010 (Optional)

Selected articles and presentations available online

Discussion cases and problems

Grade information for the course will be provided on Blackboard. Blackboard will also be used to accumulate answers to tests and to some homework assignments.

Assignments, required readings, lecture slides, other resources and answers to course related questions will be found on another system, Piazza. You can also find the latest version of the syllabus on Piazza. To utilize Piazza you need to signup with them. It's easy and it's free. Here is the signup link:

piazza.com/uh/spring2020/fina73734373

Course Requirements

Homework problems and cases to be discussed in class.

Three in-class tests

Grading: 20 – 40% homework, 20 – 40% tests, 20 – 40% final exam plus class participation.

Class Schedule and Topics

Session 1, January 14

- Course introduction and administration
- Molecules, fuels and crude oil characteristics

Preparation: Exercises 1 and 2 in Petroleum Refining, chapter 3

Read: Leffler, "Petroleum Refining ...," chapters 1, 2, 3 and 6 (26 pages)

Session 2, January 21

- Homework discussion
- Refining processes: adding value in refining
- Spreads and value calculations
- Test #1 preview

Preparation: "Crude Cutting" homework

Read: "Petroleum Refining," chapters 14 and 15 (31 pages)

Session 3, January 28

- Test #1 (Material in sessions 1 and 2)
- Review and discussion of test results
- Complexity and investment costs
- Petrol Isthria case, and Project Option

Preparation: Study for Test # 1

Session 4, February 4

- Homework discussion
- Value calculations and accounting definitions

Preparation: "Complexity" homework
Exercise 2 in "Petroleum Refining" chapter 20

Read: "Petroleum Refining," chapter 20 (11 pages)
Johnston, "Complexity Index Indicates Refinery Capability, Value", Oil & Gas Journal, 3/18/1996
Kaiser & Gary, "Study Updates Refinery Investment Cost Curves", Oil & Gas Journal, 4/23/2007

Read before Test #2: "Petroleum Refining," chapters 4, 5, 8, 9, 11
and "Simple Refinery Description"
Petrol Isthria 2010

Session 5, February 11

- Homework discussion
- Conversion economics
- Refining support facilities
- Natural gas processing

Preparation: "Crude Switching" homework

Read: "Petroleum Refining," chapters 7 and 13 (16 pages)
Exercise 2 in "Petroleum Refining" chapter 4, page 39
Exercise 2 in "Petroleum Refining" chapter 5, page 48
"Petrochemicals," chapter 2 (10 pages, optional)

Session 6, February 18

- More crude switching
- Catalytic cracking
- Product blending
- [Petrol Isthria issues]

[Preparation: Petrol Isthria Issues]

Session 7, February 25

- Homework discussion
- Blending mystery
- Value of capacity
- Investment economics
- Test #2 preview

Preparation: "Biodiesel Deal" homework

Session 8, March 3

- Industry structure and profitability
- Refining "unconventional" crude oil
- Test #2 (Processes and valuation) [Separate PI discussion]
- Review and discussion of test results

Preparation: Study for Test #2

Spring Break, March 10 (No Class)

Session 9, March 17

- Homework discussion
- Petrochemical introduction
- Synthesis gas
- Olefin production
- Stream values and costs

Preparation: Reformer Investment homework

Read: "Petrochemicals," chapters 3, 4, 5, 6 and 14 (optional)

Session 10, March 24

- Homework discussion
- Aromatics production
- Polymers and petrochemical derivative chains (PP, PVC, PET, PU)

Preparation: "Olefin Cost" homework

Read: "Petrochemicals," chapters 26, 27, 31 (46 pages, optional)

Session 11, March 31

- Homework discussion
- Real options in refining and petrochemicals
- Stochastic analysis of investments
- [Petrol Isthria project preliminary reviews]

Preparation: [Petrol Isthria preliminary proposal]
"Uncertain Future 1" homework

Session 12, April 7

- Homework discussion
- Refining-petrochemical integration
- Transfer prices
- Plastics life cycles

Preparation: "Uncertain Future 2" homework

Session 13, April 14

- Homework discussion
- Test #3 preview

Preparation: "Product Profitability" homework:

Session 14, April 21

- Test #3 (Petrochemicals)
- Review and discussion of test results
- [Review of Petrol Isthria proposal requirements]

Preparation: Study for Test #3

Final exam: 5:00 - 8:00 pm on May 7 (current schedule).